[001] # SHIFTING DEVICE

[002]

[003]

[004] The invention relates to a shifting assembly pursuant to the preamble to claim 1.

[005]

[006] In shifting assemblies for variable speed transmissions comprising a central shifting shaft, various components of the transmission are used to generate selection and shifting forces. The components serve, especially to support the driver of the vehicle, in guiding the shifting lever into the shift gates according to the gearshift pattern, while preventing damage to the components of the transmission with the support. The driver of the vehicle needs to develop a feeling for which shift gate the shifting lever is in. In this, special attention should be paid to the transition to those shift gates in which particularly small gear ratio reductions or step-ups are made or in which the reverse gear is engaged. If too small a gear ratio reduction or step-up were made or if reverse gear were engaged without the vehicle conditions allowing this, specifically if the speed of the vehicle was too great at the time the reverse in the direction of travel was made when the vehicle was not at rest, then the shifting assembly, especially its synchronized mechanisms, would suffer damage.

[007] From EP 0 479 876 B1, a selector rocker designed as a lever at the hub of which the selector or shifting shaft is realized via roller bodies that engage in axially extending guide grooves of the hub such that the components have a non-rotatable and axially displaceable design, can be swivelled from its neutral position to a selected position against the force of at least one spring element that is affixed to the housing. The mounting of the selector rocker that is designed as a lever on the selector or shifting shaft is a very costly design. Reductions in the diameter dimensions of the selector or shifting shaft must be made in order to accommodate the roller bodies, which can result in an impairment of the stability of the assembly.

[008] The object of the invention is to disclose a shifting assembly that will eliminate the disadvantages of the state of the art.

[009] The object is attained with a shifting assembly having the characterizing features of claim 1. Embodiments are the object of the dependent claims.

[010]

[011] In a shifting assembly for a multiple-gear variable speed motor vehicle transmission having a central selector or shifting shaft, which is mounted in the transmission housing such that it can be rotated and displaced axially, the rotation of the selector or shifting shaft causes the selection of a sliding sleeve to be actuated in a shift gate, and the subsequent axial displacement causes the gear to be shifted. To form the selection patterns, a device is provided on the selector or shifting shaft or on an auxiliary shaft controlled by the selector or shifting shaft, wherein the device bears a rod. The rod acts in conjunction with a contoured element, for example a lever, which is mounted in the transmission housing such that it can swivel. The outline of the contoured element mirrors the contours of the selection patterns and is spring-loaded via a spring element against the rod. When the selector or shifting shaft is turned, which corresponds to a selection process, the rod slides along the outline of the contoured element. Depending upon the design of the contoured outline and thus dependent upon the desired selection pattern, a greater or lesser amount of force must be applied during the rotation of the selector or shifting shaft, in which process the contoured element is pressed against the spring element. In this manner, the selection force can be transferred very directly to the contour. By adjusting the shape of the contour, any selection pattern can be created. The selection torque is transferred to the contoured element independently of the axial position of the selector or shifting shaft or of an auxiliary shaft that is controlled by the selector or shifting shaft. As a result, in one advantageous embodiment, the device is positioned on the selector or shifting shaft, or on an auxiliary shaft that is controlled by the selector or shifting shaft, such that said device can be displaced axially, while the rod is not displaced axially relative to the contoured element. In another advantageous embodiment,

a rotatable cylinder is provided on the rod such that it can be displaced axially on the rod, and operates in conjunction with the contoured edge of the contoured element, while the device itself is axially stationary on the selector or shifting shaft or on an auxiliary shaft that is controlled by the selector or shifting shaft. In this manner a very low level of friction between the rod and the contoured edge is ensured. The cylinder rolls along the contoured edge and can simultaneously be displaced axially on the rod, or the rod can be displaced axially within the cylinder. This type of design is particularly advantageous if the cylinder is equipped along its circumference with a groove in which the edge of the contoured element engages, so that the cylinder is held axially by the edge of the contoured element.

[012] In another advantageous embodiment, a rotatable cylinder is provided on the rod such that it can be displaced axially on the rod and operates in conjunction with the contoured edge of the contoured element, while the device itself is axially stationary on the selector or shifting shaft or on an auxiliary shaft that is controlled by the selector or shifting shaft. In this manner, a very low level of friction between the rod and the contoured edge is ensured. The cylinder rolls along the contoured edge and can simultaneously be displaced axially on the rod or the rod can be displaced axially within the cylinder. This type of design is particularly advantageous if the cylinder is equipped along its circumference with a groove in which the edge of the contoured element engages, so that the cylinder is held axially by the edge of the contoured element. In this manner, slight frictional forces are produced with the simultaneous selection and shifting as a result of the use of latching elements that can be moved in any direction. The cost of the shifting assembly and the structural space it requires are particularly favorable, and only a small number of components are required.

[013] A further advantageous embodiment shows the contoured edge with its deepest notch being in a neutral position that corresponds to a non-actuated position of rest for a shifting lever in a selection gate. The shifting lever in the shifting pattern is not actuated and, when no gear is engaged, is in a position in the selection gate that ordinarily corresponds to the position of the shifting track for the

third/fourth gear. This gate locking function of the selector or shifting shaft is a result of the spring force of the spring element acting against the contoured edge.

[014] Effects from the spring element that could impair selection and shifting comfort are not transferred by the contoured element to the selector or shifting shaft.

[015]

[016] The invention will be described in greater detail with reference to the drawings. These show:

[017] Fig. 1 a selector or shifting shaft with the device attached; and

[018] Fig. 2 an auxiliary shaft controlled by a selector or shifting shaft, with the device attached.

[019]

[020] Fig. 1 shows a selector or shifting shaft 2, on which two roller arms 4 are positioned, spaced somewhat from one another, in a device such that they are arranged non-rotatably and axially non-displaceably. The two roller arms 4 together hold a rod 6, which is firmly affixed to the two roller arms 4. A cylinder 8 is mounted on the rod 6 such that it can be rotated and displaced axially. The cylinder 8 is provided around its circumference with a groove 10. A lever 16 that is capable of swiveling around an axis 14 is mounted in a transmission housing 12. The lever 16 is supported by a spring element 18 against the transmission housing 12. In a central area the lever is equipped with a contoured edge 20 that is designed to correspond to the desired selection pattern. A deep notch 22 of the contoured edge 20 corresponds to the neutral position of a shifting lever (not shown here), which is connected to the selector or shifting shaft 2. The contoured edge 20 of the lever 16 engages in the groove 10 of the cylinder 8, causing the cylinder 8 to become fixed in its axial position on the rod 6. When the selector and shifting shaft 2 is turned, the cylinder 8 rolls along the contoured edge 20 of the lever 16, while the cylinder 8 rotates about the rod 6. Depending upon the design of the contoured edge, the rotation places more or less stress on

the spring element, i.e. the driver of the vehicle senses during the rotation of the selector or shifting shaft 2 via the shifting lever a greater or lesser amount of counterforce and can develop a feeling for which shift gate he has placed the shifting lever in with his selection. Furthermore, if the selector or shifting shaft 2 is displaced axially, the rod 6 is displaced inside the cylinder 8 and the cylinder 8 is guided radially and axially along the contoured edge 20 of the lever 16 without generating a significant amount of friction.

[021] Fig. 2 shows a selector or shifting shaft 2 on which a toothed gear 24 is arranged such that it cannot rotate. A toothed gear 26 on an auxiliary shaft 28 meshes with the toothed gear 24, so that when the selector or shifting shaft 2 is turned, the auxiliary shaft 28 is also turned. The teeth on the gears 24 and 26 overlap one another far enough that the teeth remain meshed even when they are displaced axially. Otherwise, the arrangement of the roller arms 4, the rod 6, and the lever 16 correspond to those of Fig. 1.

Reference numerals

2	selector or shifting shaft
4	roller arm
6	rod
8	cylinder
10	groove
12	transmission housing
14	axis
16	contoured element
18	spring element
20	contoured edge
22	notch
24	toothed gear
26	toothed gear
28	auxiliary shaft